Rocky Flats
Environmental Technology Site

MAN-121-OU7
Revision 0
Sampling and Analysis Plan
for OU7 Passive Aeration System

DCF-001

APPROVED BY:	/s/	/J. R. Cirillo	/	06/12/00
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DCF-002	01/12/01

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1.0 PURPOSE

This Sampling and Analysis Plan (SAP) will support sampling at the Rocky Flats Environmental Technology Site (RFETS) OU7 Passive Aeration System endpoint. The OU7 landfill has received sanitary waste, industrial waste, sewage sludge and special waste. This SAP will provide guidance for collecting accurate and reproducible samples to support water quality monitoring. The overall objective of the remedial action is to eliminate, to the extent practicable, discharge of FO39-listed waste contained in the seep water to a surface-water body.

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This SAP addresses sampling of aerated surface water from the OU7 landfill. The volatile organic compound (VOC) and semivolatile organic compound (SVOC) sample results will be used to monitor concentrations of the analytes shown in Table 2-1, VOC Water Analytes and Standards and Table 2-2, SVOC Water Analytes and Standards.

2.0 OVERVIEW AND CHARACTERIZATION

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The OU7 landfill was opened in 1968 and last received waste in 1998. The landfill is not currently accepting any waste materials. The landfill is located in the buffer zone north of the RFETS north perimeter road.

The aeration treatment system consists of a seep interception system, settling basin, flow meter, step flagstones and gravel aeration bed. The seep interception system is a perforated pipe lain in gravel. The perforated pipe collects leachate from the landfill and directs it to the settling basin. The settling basin is designed to allow dense suspended solids to settle. The water then gravity flows through the former treatment vault where the flow is measured, exits the treatment vault and daylights. Finally, the water flows over approximately one foot of flagstone steps and a six-foot long gravel bed. Maintenance is performed on a weekly basis including the removal of debris and cleaning of the discharge area.

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Previously, a granular activated carbon (GAC) system was operated from May 1996 to October 1998. In the fall of 1998, the GAC system was evaluated for performance efficiency. This evaluation showed the GAC system was not efficiently maintaining the performance objectives, so the aeration treatment system was recommended. The aeration system was installed in October 1998. Monthly sampling of the treatment system was conducted to determine treatment system efficiency and characterize the water quality. The results of the first year of system operation are reported in *Evaluation of OU7 Aeration Treatment System November 1998-October 1999 (Kaiser-Hill 2000)*.

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Table 2-1, VOC Water Analytes and Standards, lists constituents present in the effluent with performance objectives. Table 2-2, SVOC Water Analytes and Standards, lists constituents present in the effluent with performance objectives. The OU7 water samples will be analyzed for these VOCs and SVOCs.

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Table 2-1, VOC Water Analytes and Standards

Analytes	Performance Objective [a] (ug/L)	RFCA [b] (ug/L)
Cis 1,2-Dichloroethene	70	70
Benzene	1	1
Chloromethane	5.7	5.7
Ethylbenzene	680	680
Methylene Chloride	5	5
Tetrachloroethene	1	1
Toluene	1,000	1,000
Trichloroethene	2.7	2.7
Vinyl Chloride	2	2
Xylene (Total)	10,000	10,000

a Performance objectives are based on Rocky Flats Clean up Agreement (RFCA) Attachment 5, Table 1, Surface Water Action Levels & Standards, July 19, 1996.

b RFCA values are based on RFCA. Attachment 5, Table 1, Surface Water Action Levels & Standards, March 2000.

Table 2-2, SVOC Water Analytes and Standards

Analytes	Performance Objective [a] (ug/L)	RFCA [b] (ug/L)
2,4-Dimethylphenol	540	540
Acenaphthene	520	520
Bis(2-ethylhexyl)phthalate	6	10
Butyl Benzyl Phthalate	3,000	3,000
Diethyl phthalate	23,000	23,000
Di-n-butyl phthalate	10	3,650
Fluorene	1,300	1,300
Naphthalene	620	620
Phenanthrene	10	10
Phenol	2560	2,560

a Performance objectives are based on Rocky Flats Clean up Agreement (RFCA) Attachment 5, Table 1, Surface Water Action Levels & Standards, July 19, 1996.

b RFCA values are based on RFCA. Attachment 5, Table 1, Surface Water Action Levels & Standards, March 2000.

The 1996 VOC Performance Objectives are unchanged in the current RFCA standards, so the performance objectives will remain unchanged and demonstrate compliance with RFCA. The 1996 SVOC Performance Objectives analytes do not comply with the current RFCA standards for bis(2-ethylhexyl)phthalate and di-n-butyl phthalate. The standards for these two analytes will be the current RFCA standards. All future SVOC results will be compared with RFCA standards to determine compliance. If the RFCA standards are updated for any of the above listed VOCs and SVOCs, the most current RFCA standards will be used to determine compliance.

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3.0 SAMPLING AND DATA QUALITY OBJECTIVES

The primary objective of this SAP is:

- To monitor the OU7 Aeration Treatment System performance

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The sample results will be directly compared to RFCA standards to assess system performance.

4.0 SAMPLE COLLECTION AND ANALYSIS

The requirements for sample collection and management under this SAP are described in the following sections.

Under certain circumstances, the project manager may determine that additional samples not specified in this SAP are required. In conjunction with the sample coordinator, health and safety personnel, and project management, additional samples may be collected based on professional judgement. Rationale for collecting additional samples will be described in detail on sample logsheets and logbooks. Additional sampling will not require changes to this SAP.

All activities will be conducted in accordance with the RF/ER-95-0118, *Rocky Flats Environmental Technology Site Consolidated Water Treatment Facility Health and Safety Plan.*

Characterization of sample material is required prior to sample transport. Based on the requirements of PRO-908-ASD-004, *On-Site Transfer and Off-Site Shipment of Samples* and MAN-T91-STSM-001, *Site Transportation Safety Manual*, sample material must be categorized. Samples of OU7 Aeration Treatment System water have been categorized as non-hazardous and not Department of Transportation (DOT) Radioactive Material.

4.1 Sampling Approach, Location, Frequency and Analytical Methods

Initiate the sampling process by discussing sampling requirements with an Analytical Services Division (ASD) customer service representative. If required, obtain a Release Evaluation for samples in accordance with 1–P73-HSP-18.10, Site Health and Safety Practices, *Radioactive Material Transfer and Unrestricted Release of Property and Waste.* Initiate sample Chain of Custody (COC) following PRO-543-ASD-002, *Initiation, Preparation, and Implementation of Chain-of-Custody Forms.* Prepare field sample logsheets from the Analytical Services Toolkit (AST) or equivalent.

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Beginning June 2000, VOC water samples will be collected monthly from the treatment system endpoint (SW00196), which is defined as the point six feet down stream of the

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last flagstone step. Sample location SW00196 is shown in Figure 4-1, SW00196 Sample Location. Samples will be collected monthly through December 2000 or until the RFCA standards are attained for two consecutive months. Sample for SVOCs analysis will be collected for two consecutive months to verify that levels meet RFCA standards. VOC samples will be collected semi-annually in June and December, beginning in December of 2000, and continuing thereafter. If a RFCA standard is exceeded in the semi-annual monitoring, based on validated data, then a sample will be collected and analyzed the month following receipt of the validated data. Operation and maintenance of the treatment system will be evaluated if a standard is exceeded for two consecutive sampling periods. Monthly sampling will restart and continue until two consecutive monthly sampling events show no exceedance or another remedy, either new or revised, is implemented. The collection and treatment of landfill leachate will also be evaluated as part of the comprehensive closure plan for the landfill.

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Sampling the treatment system endpoint satisfies the substantive requirements of the National Pollution Discharge Elimination System permit waiver under RFCA. Water released from the OU7 treatment system is collected in the landfill pond, which is periodically pumped into Pond A-3 in North Walnut Creek. All water in North Walnut Creek passes through two regulatory control points (RFCA points of compliance) before discharge from the RFETS.

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SW00196 is sampled with a stainless steel beaker dipped by hand into the streambed. Iron solids tend to accumulate on the flagstone steps and in the streambed. Prior to sampling, a stainless steel scoop may be used to scrape the iron solids from the streambed to create a low point. The low point will be allowed to clear of solids prior to sample collection. The beaker will be slowly submerged below the water surface and allowed to fill with water. Limit the amount of solids allowed to enter the beaker from the stream bottom. The sample bottles will then be opened one by one and filled with sample material. Sample material cannot touch the sampler's gloves during sampling. If sample material touches the sampler's gloves, discard the sample and bottle and resample with a new sample bottle and sample material. Fill bottles for VOC analysis with zero headspace. Table 4-1, Water Sample Parameters, shows the analytical suite for samples.

The bottles will be closed and bottle exterior decontaminated according to RMRS/OPS-PRO.127, *Field Decontamination Operations*. Then label and custody seal the samples as required in RMRS/OPS-PRO.069, *Containing, Preserving, Handling and Shipping of Soil and Water Samples*. If required, the bottles will be surveyed as specified on the sample Property Waste Release Evaluation (PRE). The sample material will be labeled as required in Radiological Safety Practices (RSP) 9.02. and PRO-908-ASD-004, *On-Site Transfer and Off-Site Shipment of Samples.*

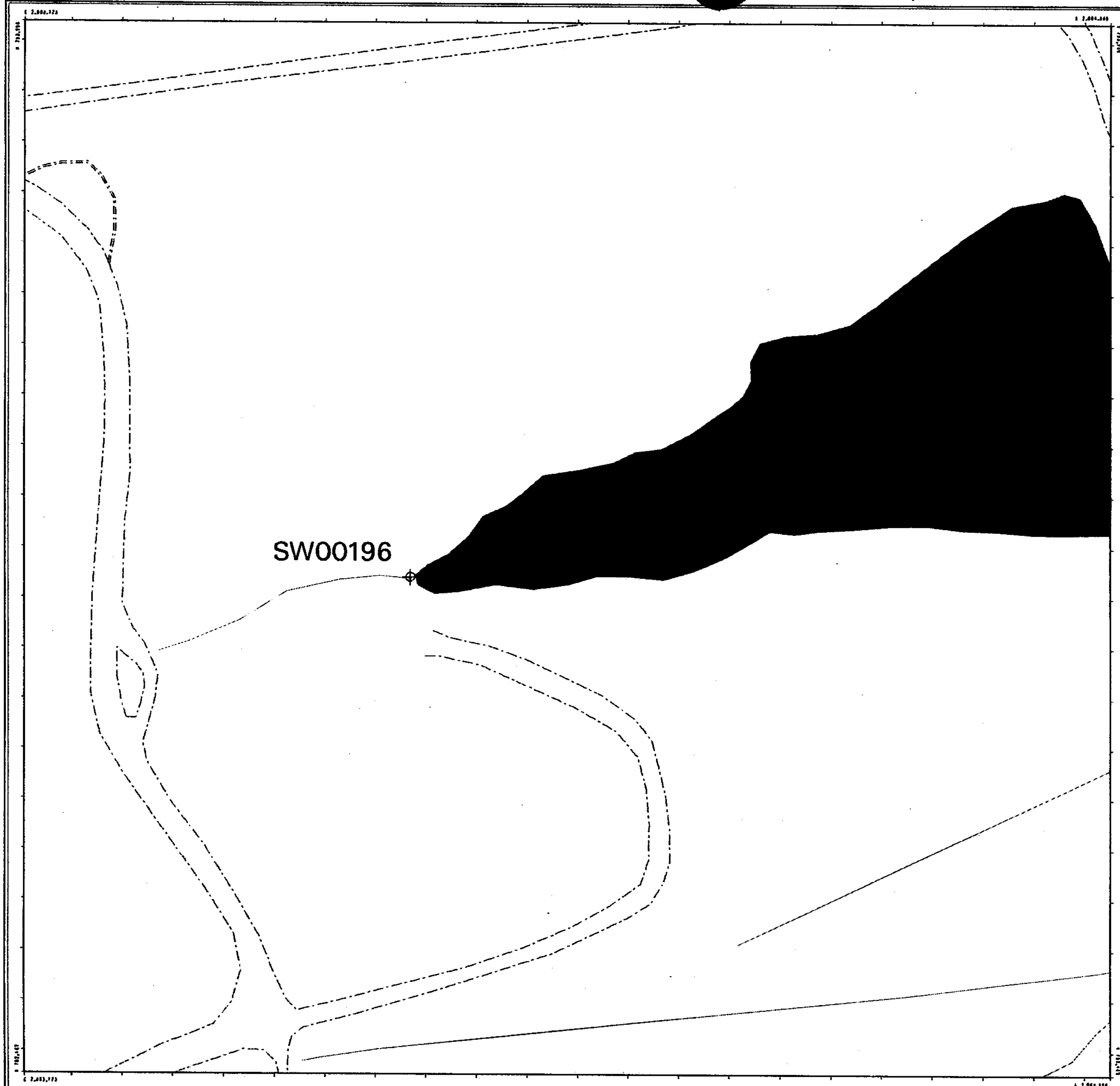

Figure 4-1
Location of SW00196

EXPLANATION

⌖ Surface Water Monitoring Location

Standard Map Features

- Lakes and ponds
- Streams, ditches, or other drainage features
- Paved roads
- Dirt roads

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Scale = 1 : 1470
1 inch represents approximately 123 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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MAP ID: 2k-0229

May 19, 2000

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Table 4-1 Surface Water Sample Parameters

Location Code	Analytical Method	Line Item Code [a]	Analytes	Container [b]	Preservative [b]	Holding Time
SW00196	SW-846 Method 8260A	SS01B004	Volatiles	3 x 40 ml glass VOA	Zero Head Space 4C	7 days
SW00196	Radscreen [c]	OS01A003	Alpha & Beta	40 ml glass	None	6 months
SW00196	SW-846 Method 8270	SS02B008	Semi-Volatiles	3 x 1 Liter Amber Glass	4C	7 days to extraction
SW00196	Trip Blank	SS01B004	Volatiles	3 x 40 ml glass VOA	Zero Head Space 4C	7 days

a Line item codes may be updated; they then can be modified with approval from ASD.
b Sample containers and preservation can be modified with approval from ASD.
c Radscreen is only required if specified on the Property Release Evaluation.

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4.2 Field Measurements

Field measurements will be done on all real samples collected from the treatment system. Temperature, pH, conductivity, odor and color will be measured on an aliquot of sample material collected during sampling. Field measurements may be measured from a field sample bottle. Conductivity and temperature will be measured prior to pH. Odor and color are observations from the field sampler. All field instruments used will be calibrated on the day of use, prior to sampling. Conductivity and temperature will be measured with an Orion Model 128 conductivity meter. The conductivity meter will be calibrated as outlined in *Models 128, 130 and 135 Conductivity Meters*. The pH will be measured with a Cambridge Conductivity/Temperature/pH meter. The pH meter will be calibrated according to *Instruction Manual Digital Conductance, Temperature, and pH Tester, Catalog No. 01535*. If a different instrument is used, the model information and calibration information will be documented in the sample logbook and on field log sheets.

Excess sample material will be returned to the treatment system streambed after field measurements are conducted.

4.3 Sample Packaging

After collection samples will be packaged, managed and transported as required in RMRS/OPS-PRO.069, *Containing, Preserving, Handling and Shipping of Soil and Water Samples;* PRO-908-ASD-004, *On-Site Transfer and Off-Site Shipment of Samples*, and MAN-T91-STSM-001, *Site Transportation Safety Manual.* Bag the samples and place in an approved sample cooler. Place samples in the cooler with adequate cushioning to prevent sample damage during transport. Place blue ice and adequate absorbent in the cooler. Secure the cooler in the bed of the field truck and confirm proper package labeling is in place. Sample cooler temperature will not be measured during on-site package transfers.

4.4 Waste Management

Waste material generated during sampling activities will be managed according to the Waste Stream and Residue Identification and Characterization (WSRIC)-Building STF.

5.0 QUALITY CONTROL SAMPLES

The following Quality Control (QC) samples will be collected to support the aeration system water sampling:

- Duplicates: Duplicate (co-located) samples will be collected in the same manner and analyzed by the same analytical methods by the same laboratory as the grab samples described in Section 4.1. Duplicates will be sampled from the same sample location at approximately the same time as the real sample. The samples will be collected at the ratio of at least one duplicate per twenty real samples. All duplicates will be collected using the same sampling equipment used for the collection of real samples. Sampling equipment will not be decontaminated between collection of the real and duplicate sample. Duplicate samples will be evaluated to ensure an adequate Relative Percent Difference (RPD) between the real and duplicate sample.

- Equipment Rinse Blanks: Rinse blanks will be prepared by filling sample bottles with distilled water poured over decontaminated sampling equipment after VOC sample collection. Rinse blanks will be collected at the ratio of at least one rinse blank per twenty equipment decontaminations.

NOTE

Samples preserved with hydrochloric to a pH less than or equal to 1.96 shall be managed as hazardous material under the Site Transportation Safety Manual.

- Trip Blanks: Trip blanks will be shipped with VOC samples sent off site for analysis. The trip blanks will be prepared prior to field activities. The trip blank may be preserved with hydrochloric acid to pH < 2 and zero head space. Trip blanks will travel with samples from sample collection through sample receipt at the analytical laboratory. Trip blanks are prepared at RFETS from distilled water.

Table 5-1, QC Sample Frequency and Quantity

Sample Type	Frequency	Estimated Quantity
Duplicates	1 for every 20 real samples	1
Rinse Blanks	1 for every 20 real samples	1
Trip Blanks	1 for each sample shipment	2 per year

6.0 SAMPLE DESIGNATION AND DATA MANAGEMENT

Each sample will be assigned a unique sample number based on the ASD Report Identification Number (RIN). Each sample number is made up of three components:

- Report Identification Number
- Event Number
- Bottle Number

The first part of the sample number will be the RIN. The RIN is used to track data. Unique RINs will be assigned to each semi-annual sampling. The RIN will have a seven-digit alphanumeric code starting with a numeric code for fiscal year. The RIN will be followed with a dash "-" and then the event number. The event number is a three-digit code starting with "001". The following event numbers should be sequential. Each separate sampling event will usually have a unique event number with the RIN. QC samples will have unique event numbers to support blind submittal to the laboratory. The event number will be followed by a period "." and the bottle number. The bottle number will be a three-digit code starting with "001". Under each event, each additional bottle should have a sequential bottle number. The bottle number will be used to identify individual sample containers under the same event number.
Each sample will require the following sample QC description:

QC Code	QC Description
REAL	Regular Sample
DUP	Duplicate Sample
RNS	Equipment Rinse Blank Sampled
TB	Trip Blank (VOCs only)

7.0 SAMPLING SUPPORT INFORMATION

This section details the sample handling, document and quality assurance requirements necessary to support the completion of this project.

7.1 Sample Handling

Sample preservation will follow RMRS/OPS-PRO.069, *Containing, Preserving, Handling, and Shipping of Soil and Water Samples* and ASD recommendations. All water samples will be collected without the use of filters. When reusable-sampling equipment is used, the equipment will be decontaminated in accordance with RMRS/OPS-PRO.127, *Field Decontamination Operations*. All sampling equipment will be decontaminated prior to use.

7.2 Documentation

Collection data shall be recorded on the COC forms. COC forms will be filled out after samples have been collected and prior to moving samples from the field. Field Logsheets may be project-specific forms or generated in AST. Logsheets will be completed by samplers after sampling. Any modifications to information will be lined through, initialed and dated. The information will then be entered into AST. The updated logsheet will then be reviewed by a peer reviewer. Either the reviewer will indicate changes to be made on the logsheet or they will sign the QC Signature/Date line. If changes are required, changes will be made (not by the reviewer) in AST and the new printed logsheet will be peer reviewed again. The process continues until the reviewer signs the logsheet. The AST record is then marked as QC'd with a QC date for "Event/Measurement QC'd" and "Bottles QC'd". Data is downloaded nightly from AST to the Soil, Water Database. Once the information is QC'd in AST, the logsheets are considered NON-QA records.

Sampling logbooks are forwarded to the Site Records Center in accordance with 1-V41-RM-001, *Records Management Guidance for Records Sources*.

7.3 Quality Assurance

Components and processes of this sampling plan will comply with the Kaiser-Hill Quality Assurance (QA) Program (Kaiser-Hill, 1999). The QA Program is consistent with quality requirements and guidelines mandated by the EPA, Colorado Department of Public Health and Environment (CDPHE), and Department of Energy.

Field sampling quality control will be conducted to ensure that data generated from all samples represents the actual conditions in the field. QA will be monitored by the collection of QC samples, including duplicates, equipment blanks and trip blanks.

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Data validation will be performed on 25% of the laboratory data according to the Rocky Flats ASD, Performance Assurance Group procedures. Samples will be randomly selected by ASD to fulfill 25% validation. Laboratory verification shall be performed on the remaining 75% of the data. Data validation will be performed according to ASD procedures. Analytical laboratories supporting this task have all passed regular laboratory audits by ASD.

Data validation and verification is performed in accordance with the Data Assessment Guidelines (DAGR01). Analytical data are evaluated using the guidance established in the procedure RF/RMRS-98-200, *Evaluation of Data for Usability in Final Reports*. This procedure establishes the guidelines for evaluating the analytical data with respect to the PARCC parameters. The data are evaluated for the PARCC parameters as discussed below.

PARCC parameters are indicators of data quality. This procedure establishes the guidelines for evaluating analytical data with respect to the PARCC parameters.

Precision. Precision is a measure of agreement between replicate measurements of the same property, under prescribed similar conditions. Precision is evaluated quantitatively by using the following equation:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} * 100$$

C_1 = first sample result (in terms of concentration)
C_2 = duplicate sample result (in terms of concentration)

The purpose of the field duplicate samples is to evaluate the precision of the field sampling process. The acceptable RPD limits for non-radiological field duplicate measurements are ≤ 30% for water. At least 85% of all quality control samples are required to comply with the established precision, or RPD goals. Duplicate samples exceeding the RPD require an explanation of the deficiencies.

Accuracy. Accuracy is a qualitative measure of the degree of agreement between a measurement with a reference or true value. The closer the measurement to the true value, the more accurate the measurement. Analytical data are compared with the required analytical method, detection limit, matrix spikes and matrix duplicates to assess accuracy.

Representativeness. Representativeness is a measure of the degree data accurately and precisely represents a characteristic at a sampling point. Representativeness is a qualitative term that should be evaluated to determine whether samples are collected in such a manner that the resulting data reflect the contamination present. Representativeness is assessed by evaluating equipment rinse blanks and trip blanks and obtaining an adequate number of samples.

Completeness. Completeness is a measure of the amount of valid data obtained from a system compared to the amount of data scheduled for collection. Usable data consists of data that are validated or verified and not rejected. A completeness goal of 90% has been established for this project. If this goal is not met, additional sampling may be necessary to adequately achieve project objectives. Completeness is calculated using the following equation:

$$Completeness = DP_u = \left[\frac{DP_t - DP_n}{DP_t}\right]100$$

Where: DP_u = Percentage of usable data points
DP_n = Non usable data points
DP_t = Total number of data points

Comparability. Comparability is a qualitative parameter. Consistency in the acquisition, handling, and analysis of samples is necessary for comparing results. Data developed under this investigation are collected and analyzed using standard EPA or nationally recognized analytical methods, and QC procedures to ensure comparability of results with other analyses performed in a similar manner. Data resulting from this sampling effort may be compared to other data sets.

8.0 RECORDS

The following records generated during the performance of this procedure must be copied and distributed as follows:

Record Identification	Record Type Determination	Protection/Storage Methods	Processing Instructions
OU7 Sample Logbook	QA	Sample manager shall implement a reasonable level of protection to prevent loss and degradation while in process. In process, documents shall be protected utilizing standard office equipment and methods.	Sample manager transmits to Site Document Control
Original Chain of Custody Forms	QA		Transferred with samples to the laboratory and then forwarded to ASD
Copies of Chain of Custody Forms	NON-QA		Sample manager uses, as needed, for sample tracking
Field Logsheets	NON-QA		Sample manager ensures the information is entered in AST

9.0 REFERENCES

1-V41-RM-001, *Records Management Guidance for records Sources*

RMRS/OPS-PRO.127, *Field Decontamination Operations*

Data Assessment Guidelines (DAGR01)

DOE, 1996. Final Rocky Flats Cleanup Agreement, Rocky Flats Environmental Technology Site, Golden , CO

DOE, 2000. Rocky Flats Cleanup Agreement, Rocky Flats Environmental Technology Site, Golden, CO

EPA, 1992. US EPA Test Methods for Evaluating Solid Waste, Solid Waste-846, third edition, Method 8260A, Rev. 1

EPA, 1994, *Guidance for Data Quality Objectives Process*, EPA QA/G-4, Final

Kaiser-Hill Company, L.L.C., 1999, Rocky Flats Environmental Technology Site, *Kaiser-Hill Team Quality Assurance Program*

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Kaiser-Hill Company, L.L.C., 2000, *Evaluation of OU7 Aeration Treatment System, November 1998-October 1999*

MAN-T91-STSM-001, *Site Transportation Safety Manual*

PRO-543-ASD-002, *Initiation, Preparation, and Implementation of Chain-of-Custody Forms*

PRO-908-ASD-004, *On-Site Transfer and Off-Site Shipment of Samples*

Radiological Safety Practices-9.02

RMRS/OPS-PRO.069, *Containing, Preserving, Handling and Shipping of Soil and Water Samples*

RF/RMRS-98-200, *Evaluation of Data for Usability in Final Reports*

RF/ER-95-0118, Resource Technologies Group. *Rocky Flats Environmental Technology Site, Consolidated Water Treatment Facility Health and Safety Plan*

Site Health and Safety Practices 1–P73-HSP-18.10, *Radioactive Material Transfer and Unrestricted Release of Property and Waste*

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